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The Alberta Agricultural Research Trust 1981-1982

Annual Report

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Cover photo: Parkland Farm, University of Alberta Edmonton Research Station

Chairman's Report

In its 16th year of operation, the Alberta Agricultural Research Trust (AART) continued to support activities which met the ever-present need for new technology in Alberta's agricultural industry.

Agriculture is a fundamental part of our province's economy. Though it does not have a glamorous profile, agriculture offers opportunities for dynamic growth and ongoing stability that are unmatched in our economy.

Key to fulfilling this promise are the need to diversify, to incorporate existing knowledge into current production and to generate new technology to fuel future advances. The task of attaining part or all of these objectives falls to research.

The Alberta Agricultural Research Trust is only one of several research support agencies in Alberta; however, the AART's Board of Trustees feels the program is unique in its approach to research development.

For most projects it supports, the Trust uses combined financial resources from industry and government to offer 100 percent funding to a number of new and ongoing projects. Most are conducted by university or government researchers, the traditional sources of new technology for Canadian agriculture.

As well, the Trust encourages agricultural research that does not have the opportunity for support from within the province's private sector. Each year the Trust offers to support up to $50,000 worth of research which does not have joint or cooperative funding.

A $500,000 grant from Alberta Agriculture in 1966 provided the Trust's first funding support, with the Department granting the Trust an additional $250,000 each year to continue its support efforts. Of this amount, up to 20 percent or $50,000 is allotted for projects which do not have direct industry support. The Board of Trustees strongly feels that it has successfully encouraged private sector participation through its emphasis on cooperative project funding, usually on a one-for-one basis.

In 1981-82, the Alberta Agricultural Research Trust supported 28 projects worth more than $314,000. This total includes funding supplied by those cooperating in private sector projects. This brings the Trust's total research effort since inception to about 330 projects that have received approximately $5.3 million in funding support.

While the Board arrives at decisions through a number of operating guidelines, one guideline, above all, is crucial — that all research supported by the AART be relevant to Alberta's agriculture industry. In this regard, the Board feels its efforts have continued to be successful.

On behalf of the Board of Trustees of the Alberta Agricultural Research Trust, I extend our appreciation to the participating research scientists, the Grants Committee and to those organizations and businesses which have continued to provide financial support to agricultural research in Alberta.

H.B. McEwen
Chairman, Board of Trustees

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AGRICULTURAL ENGINEERING

BELLOW, D.G.

Measurement of loads on a cultivator shank

The work consisted of measuring the draft, vertical and lateral forces that are caused by cultivation under a variety of depth, speed and soil conditions. Two types of cultivator tools were evaluated; 406 mm wide sweeps both in leading and trailing positions, and a 50 mm wide spike. Draft forces were found to increase with depth of tillage as did the vertical force but to a lesser degree. Where a trailing sweep was overlapped by a leading sweep the lateral force on the trailing sweep was measured to be 20% of the draft force. Formulas were developed which can be used to predict the forces of cultivation as a function of depth of tillage. There was little correlation of forces with speed in the range 6-12 km/h. Five test sites were evaluated in dry hard-packed soils classified as clay-loam.

HARRISON, H.P.

Potato damage losses

The main object was to determine the effect of tuber temperature at harvest on tuber damage and the interaction of temperature and the tuber cultivar, maturity and drop height. The results indicate that although cultivars vary in tuber damage, most exhibit a minimum damage for a temperature a few degrees above freezing. In general, tuber maturity increased the resistance to tuber damage whereas increased weight and drop height increased the damage. The temperature did not appreciably affect damage at the lowest and highest levels of drop height but at the mid-level an optimum temperature was quite evident.

McQUITTY, J.B.

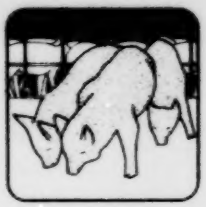
A systems analysis of environmental control in total confinement livestock production

A simulation model was developed to describe the biological, physical, meteorological and economic parameters of environmental control alternatives in animal housing. In an interactive mode, the model may be used for extension purposes to predict heating and ventilating requirements, and energy consumption, of totally enclosed farm buildings, including animal units. The accuracy of the model, however, as a systems tool has been found to be very dependent on the animal algorithm. Growth response and production algorithms, which take into account environmental, nutritional and management parameters for various species and age groups of livestock require extensive development and validation before the reliability of system analysis data can be assured. The development of such algorithms was outside the scope of this project.

McQUITTY, J.B.

Heat and moisture loads in swine feeder barns

Four swine feeder barns located in central Alberta each were monitored continuously under cold weather conditions for 48 hours to establish heat and moisture loads in commercial operations. Total heat output ranged from 500 to 850 kJ/pig/hour, being higher in two solid-floored barns than in those with partially slatted floors. Approximately 70% of the total heat output per pig was in the form of sensible heat in all four barns. Moisture loads ranged from 0.054 to 0.104 kg/pig/hour, being significantly higher in the solid-floored than in the partially slatted-floored barns. Management practices appeared to influence the level of pig activity and consequently the heat and moisture loads for a specific barn. Fluctuations in total heat output of up to 300kJ/pig/hour appeared to reflect changes in pig activity patterns. All four barns were found to have excessive ventilation rates for the prevailing conditions and, in three instances, to be operated at undesirably low pressure differentials.



ANIMAL SCIENCE

BENN, M.H.

Larkspur cattle poisoning

Cattle losses as a result of poisoning by the tall larkspur *Delphinium brownii* Rydb. (D. *claucum* Wats.) are a considerable hazard for ranchers in the western ranges of Alberta. Although range-management (to the extent of keeping cattle off the ranges during the high risk period, May-June) can reduce this hazard, problems remain (apart from the loss of time poisoning can still occur later in the season). Our objectives were to identify the toxins in the plants, establish their modes of action, and develop a treatment that would save otherwise fatally poisoned animals.

In our initial studies we were able to demonstrate that the principle toxin was the diterpenoid alkaloid methyllycaconitine (MLA) and that its action in rat, guinea-pig and frog assays was primarily as a curare-like neuromuscular poison. In our final experiments carried out at the Regional Veterinary Laboratory of Alberta Agriculture at Airdrie, directed by Dr. P.N. Nation, we checked the effects of MLA on calves. The symptoms observed after intravenous administration of the alkaloid as a citrate salt were consistent with our previous conclusions. So too was the effectiveness of physostigmine as an antidote.

Although it can be argued that the normal course of animal poisoning involves the absorption of the toxin after larkspur has been eaten, and may thus involve a rumen transformation product of MLA, the general pattern of effects which we observed agree well with field observations of accidentally larkspur-poisoned cattle.

We conclude that if an animal has collapsed, and there is good cause to suspect that it has been fatally poisoned by tall larkspur the best course of action is to inject physostigmine (at about 0.08 mg/kg). Since the animal may have taken in a large amount of the plant, from which the MLA is slowly passing into the blood-stream, it may be necessary to repeat the physostigmine treatment over a span of several hours, until the poison has been eliminated, and the animal recovers.

CHRISTOPHERSON, R.J., J.R. THOMPSON

Cattle hormones-influences of environment and relevance to production

Thyroid hormone concentrations were higher in steers housed in outdoor pens during winter than for steers in a heated barn. During cold weather, increasing the feed intake from maintenance to twice maintenance reduced thyroxine concentrations but increased triiodo-thyronine concentrations. As the latter is the physiologically more active thyroid hormone, the thyroid status of cattle is increased both by cold environments and by increased food intake. In another experiment, plasma concentrations of adrenaline and noradrenaline were increased following feeding. Thyroid hormones plus adrenaline and noradrenaline likely induce much of the increased heat production of cattle in cold environments and may also cause part of the heat increment of feeding and, therefore, influence the energy requirements of cattle. Reproductive hormone concentration patterns were similar in control and double muscled cows. Since the double muscled cows conceived, it is likely that the poor reproductive performance of double muscled cows was not related to alterations in reproductive hormones during the estrus cycle, but was due to embryonic and fetal mortality.

MATHISON, G.W.

Supplementation of straw diets for beef cows

Several experiments were conducted to determine if various supplemental nutrients would improve the performance of pregnant beef cows fed diets containing from 76 to 94% straw in the winter. In one experiment with 64 cows both feed intake and weight gains were increased (16-17%) when the protein content of a diet containing 94% barley straw was raised from 5.2 to 6.2%. Supplemental magnesium also resulted in increased weight gains and feed intakes. The mean blood plasma magnesium concentration was only 1.4 mg/100 m h which was indicative of a magnesium deficiency. Symptoms of acute magnesium deficiency were observed in one cow and confirmed by blood analysis. Supplementary selenium plus vitamin E had no major effect on weight gain or feed intake in this experiment.

In metabolism trials the apparent digestibilities of dry matter, energy, acid detergent fibre, and crude protein were improved by 8.7, 10.9, 14.0 and 6.6% respectively, when B-vitamins were added to straw diets fed to mature steers. B-vitamin supplementation had no influence on the concentrations of volatile fatty acids or ammonia in the rumen, nor was the rate of dry matter digestion *in vitro* influenced by B-vitamins. B-vitamin supplementation had no influence on the winter weight changes or feed intake of pregnant beef cows.

MATHISON, G.W.

Thiamin supplementation of all-concentrate diets for steers

The response of the erythrocyte transketolase enzyme to added thiamin pyrophosphate (TPP effect) was used to examine the thiamin status of six groups of Alberta steers. 2/7% of the samples collected from 331 cattle exhibited a TPP effect in excess of 15% and thus these cattle were considered to be deficient in thiamin. A negative correlation existed between dietary protein levels and the TPP effect across groups of cattle. In a feeding experiment with 30 steers thiamin supplementation of the diet increased daily weight gains from 0.92 to 1.14 kg per head. A thiamin deficiency existed at 11 times and in nine different animals throughout the feeding period as determined by erythrocyte TPP effect. In a second experiment 96 steers were fed all-concentrate diets supplemented with thiamin, magnesium or both nutrients. No significant differences in animal performance or selected blood parameters occurred in the 98 day experiment. In a third experiment steers did not respond to dietary thiamin or injected vitamins but feedlot performance was depressed when magnesium oxide was added to the diet.

It was concluded that the routine practice of supplementing feedlot diets with thiamin could not be recommended at this time.

THOMPSON, J.R.

Molecular composition of protein from specific muscles of meat producing animals

Connective tissue sheaths provide the supporting framework for individual skeletal muscles. The strength of these sheaths and their contribution to meat toughness increase with animal age. The sheaths are comprised of a fibrous component (collagen) and a relatively amorphous component (the proteoglycans). The proteoglycans are proteins to which are attached long chains of carbohydrates (glycosaminoglycans) which are involved in the organization of collagen fibers, and influence tissue water holding capacity. Age related changes were studied in the triceps brachii muscle. In the outer connective tissue sheath or epimysium (gristle) the collagen concentration increased ($P<0.05$) while its solubility decreased ($P<0.05$) with animal age. These changes were associated with a decrease ($P<0.05$) in the glycosaminoglycan concentration. Relatively smaller changes were observed in intramuscular collagen properties and glycosaminoglycan concentrations. A detailed characterization of the glycosaminoglycan fractions from both the intramuscular and epimysial connective tissues revealed that each connective tissue type had a unique composition that could be related to the nature of the associated fibrous collagen component.

ENTOMOLOGY

HUDSON, J.E. (B. HOCKING)

Mosquito studies in the Edmonton area

The effects on mosquito activity of barrier strips of dichlorvos and propoxur sprayed on the vegetation in wooded ravines, were assessed by means of insect wind traps and by landing counts on human bait. Dichlorvos at 1.12 kg a.i./ha reduced trap catches by 70% for one day after treatment; bite count data were inconclusive. Propoxur at 0.34 kg a.i./ha reduced trap catches by 44% and bite counts by 100% for one day after treatment. From these results a continuation of the barrier strip method could not be recommended. Many other insects (chiefly other Diptera) were caught in the traps, but there were no consistent reductions in catches in the treated strips. Catches of mosquitoes were consistently higher on the down-valley sides of the traps than on the up-valley side, and catches were generally higher in traps in the ravines than in the traps on the plain above. The effectiveness of malathion sprayed by helicopter was measured by kills of caged, wild-caught mosquitoes and by bite counts. Boom and nozzle application at 0.7 kg a.i./ha killed only 27% of the mosquitoes (mostly *Aedes vexans*) caged in the woods at the Whitemud Creek. Ultra-Low-Volume application at 0.3 kg a.i./ha killed only 8% of the caged mosquitoes (mostly *Aedes fitchii*) at Whitemud creek, but 94% of the caged mosquitoes at Victoria Park golf course, a more open area.

MITCHELL, B.K.

Sensory systems important in feeding behaviour in the red turnip beetle

A major objective of this work was to determine if adult red turnip beetles have similar chemosensory capacity to the larvae which we had studied previously. To this end, ultrastructure and physiology of the adult galeal sensillar complex were investigated. The adult system consists of 8-12 uniporous, blunt-tipped, apical pegs and a single, aporous, sharply-pointed apical hair. The uniporous pegs are

each innervated by four chemosensory cells while the aporous hair is innervated by two cells of unknown function. The larval galea have a single sensillum of each type.

The adult chemosensitive pegs are similar to the larval peg in their response to various plant chemicals. Since the adult preparation is superior to the larval one, we were able to clarify and expand our interpretation of cell specificity in this system. Sugar sensitivity remains relatively unchanged from larva to adult, though the sugar-sensitive cell in larvae is also sensitive to amino acids. Sugar-sensitive cells of both larvae and adults respond to the glucoside arbutin. Of the two glucosinolate-sensitive cells, one does not appear to differ between adults and larvae while the other is more dose-dependent in adults. Arbutin also stimulates one of the glucosinolate-sensitive cells in adults but not in larvae. One of the glucosinolate-sensitive cells (the one that does not respond to arbutin) also responds to feeding deterrents such as sparteine sulfate, nicotine and quinine. The complex inter-relationships of these cells shows that sensory input regulating feeding behaviour can be complex, even when single chemical compounds are presented. This is most clearly shown by responses to sparteine (from primarily one cell) and glucosinalbin (from the cell responding to sparteine and one other cell), which signal deterrence and acceptance respectively.

To our knowledge, this is the first demonstration of such specificity and sensitivity differences between larval and adult forms where there are presumably limited differences in trophic behaviour. The more complex nature of the adult gustatory system may result from greater demands in terms of food-plant selection. The insensitivity of adults to amino acids may only be apparent since all sensilla were not studied, but the difference between sugar-sensitive cells in the two stages deserves further study. From the results, one might predict that adult feeding would be more influenced by combinations of arbutin and glucosinalbin. Behavioural experiments would be useful for clarification of some of these points. Unfortunately, both larvae and adults of this species are refractory to many kinds of artificial feeding substrates.

FOOD SCIENCE

JELEN, P.

Aqeous extraction of rapeseed (Canola) oil

The objective of this project was to investigate technical feasibility, yield maximization and final product quality of canola oil and canola protein obtained in a simultaneous aqueous extraction of ground, enzyme deactivated seed. The emphasis of the proposed process was on yield maximization in the oil extraction, combined with acceptable yields of high quality protein concentrate. Technical parameters of the two-step extraction method, which avoids the inherent problems of the currently used industrial hexane extraction, were extensively evaluated in laboratory conditions.

Major findings of this work indicated that:

(1) the maximum oil yields achievable by the aqueous extraction are in the range of 88-92%;
(2) the oil quality is higher than that of the industrial crude oil due to lower sulphur content and substantial elimination of phospholipids (thus the oil can be considered equivalent to a degummed crude oil);
(3) a protein concentrate containing about 70% protein (dry weight basis) and virtually no glucosinolate is obtainable as an additional valuable food-grade product;
(4) the solid residue ("meal") may contain up to 32% protein, 25% fiber, and no glucosinolate, and thus could be used as an animal feed supplement.

The proposed technique consists of two stages. The first stage - a simple washing of ground canola seed with water at approximately 1:3 ratio - yielded, on the average, 52% of the available oil. In the second stage, the wet solid residue was extracted at alkaline conditions (pH 11, 25°C) to obtain an oil-water emulsion containing alkali-solubilized protein.

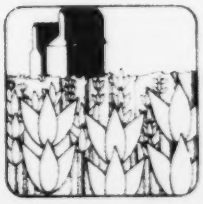
Solvent extraction of oil from the dried emulsion produced additional 32% oil and a protein concentrate with 69% protein content. In industrial conditions, a more efficient method of oil recovery by breaking the emulsion with mechanical or chemical means must be found to make this complete process a viable technological alternative. The first extraction step could be suitable in its own right as a replacement for the expensive mechanical pre-pressing step currently used in the industrial solvent extraction processes operating in Alberta.

OORAIKUL, B.

Flexible packaging of bakery products

A combination of CO_2 and N_2 (50:50) was found effective for initial extension of shelf life of crumpets from 3 to 14 days at ambient temperature. Carbon dioxide together with a minute quantity of potassium sorbate completely inhibits mold growth, provided that O_2 level in the package is not greater than 7%. Shelf life of the product packaged under such conditions can be extended further if the storage temperature is below 24°C. Under such conditions the rate of CO_2 produced in-package by micro-organisms is in equilibrium with that absorbed by the product, preventing swelling of the package. However, prolonged storage under such conditions results in a product with rather crumbly texture and slightly greyish in color.

Results from the first order design of the response surface technique indicated that water activity (a_w) and pH of the product, CO_2 atmosphere in the package and storage temperature are the most important factors determining microbial growth and activities in the product. Appropriate reformulation of the product which is then packaged under a suitable atmosphere and stored under a suitable temperature appears to be the best means for shelf life extension of the product.



PLANT SCIENCE

KNOWLES, R.H.

An evaluation of turfgrass species and cultivars to variations in management practices

The objectives of this trial were two-fold. Primarily, interest lay in observing the effects of cultural practice on a select number of elite bluegrass (poa) and fescue (Festuca) cultivars. In the second instance interests were broader and were concerned with the performance of turfgrass cultivars belonging to species within the genera Agrostis, Festuca, Lolium, Poa and Phleum.

In the cultural trial data was obtained from a double split plot on which mowing (two heights of cut 1.9 cm and 3.9 cm) and fertility (450 gms and 675 gms N/100 m^2) treatments were imposed. Mowing was done weekly while fertilizer was applied twice annually. In the general cultivar trial normal management practices prevailed. Ratings were made once a month for the period May through September. Colour, texture and density were the qualities examined.

The first cultivars were received in 1970, and planted in June of that year. Bluegrass and Fescues formed the bulk of the entries though several mixtures and blends, ryegrasses and bentgrasses were also included in the trials.

Of the 27 original Kentucky Bluegrass cultivars tested, the following are deserving of special comment. Baron was the standard against which other Kentucky bluegrasses were compared and for the duration of the trial, only truly outstanding cultivars exceeded or matched its performance. Under conditions of average fertility, only Nugget has exceeded the performance of Baron. Under conditions of high fertility, however, Baron was slightly better if mown high, but only equal if given the low cut treatment. Surprisingly, the widely publicized cultivar Fylking was unimpressive under low conditions at both fertility levels. The comparatively old cultivar, Merion, has held up surprisingly well in the ratings, staying close to Baron in the high mown plots, but noticeably inferior in response to low mowing. The two older but well known cultivars, Park and Windsor, were disappointing performers. Both were consistently poor to mediocre in the Edmonton environment. While Sydsport tended to out-perform its sister cultivars, as a group Primo, Sydsport, Birka and K 412, gave a consistently very good performance.

In 1974, ten additional cultivars were introduced. All of these performed equal to or better than the established check plot of Baron. It is unfortunate that a new check plot of Baron was not included with these entries, however, on the basis of comparisons made with the records of the original plot of Baron at the same test age, it is apparent that these cultivars are generally very good. Olymprisp, Enita, EVB 1942 and P-142 (Touchdown) were equal to or better than Baron.

In the Fescue trial, the standard cultivar has been Highlight for both Chewings and Creeping Red Fescue entries. Cultivars from fescue species other than these two did not perform satisfactorily.

Of the original 1970 entries, only three of the Chewings cultivars showed superior qualities. These were Barbantia, Flevo and Famosa. On the other hand, several cultivars of Creeping Red Fescue achieved a level of excellence under Alberta conditions. Among these were Dawson, Jamestown, Oasis, S-59, Erika, Polar and Arcta Red.

In 1973, four French cultivars, namely Amboise, Blere, Chambord and Vendome were entered in the general cultivar trial. Only Amboise, a Creeping Red Fescue has shown any real value.

In 1975 Encota, Ensylva and Endarky were added to the general fescue cultivar trial and of these Endarky and Encota have given the best performance to date.

The Bentgrass trials were discontinued in 1975 after most cultivars had shown greater then 50% winter injury. Prior to this, Bardot and Exeter, two colonial bentgrasses, had shown superior qualities. Emerald creeping bentgrass never performed well at Edmonton, though it was highly recommended by other Canadian test stations. It would be fair to say however, that because of lack of funds, it was not possible to give the bentgrasses the full extra maintenance called for and this might account for the poor performance of some cultivars.

Ryegrasses at Edmonton have yet to show evidence of being suited to this climate. By 1974, the original 13 entries had been so seriously damaged by winter conditions that the trial was abandoned. Stress from winter conditions showed up as early as the first spring following seeding. Outright killing at this time was minimal, but plants were slow to recover. In subsequent years, however, there was progressively more winter killing until finally even the hardiest cultivars were destroyed. It was interesting to note that Manhattan and Norlea showed more resistance to winter injury in the early years of the trial than all others, namely Melle, Fortis, Sceempter, Barenza, Perma, Brabantia, WE10, Pelo, NK 100, and Linn.

In 1975, Sprinter, Yorkton, Pennfine, Manhattan and Norlea were established and performed well during 1976. However, all were completely destroyed by the comparatively mild winter of 1976-77.

Citation and Derby which were established in 1976, survived without injury, however, this might well have been due to the normal resistance to winter injury so frequently expressed by new seedlings.

In the trial involving Mixtures and Blends, all entries were subjected to only one treatment, hence potential behaviour of components was not a factor that could be readily evaluated. On the basis of combining ability however, one could make judgements. On this basis the mixture DB 64 with its two elite components, Baron and Dawson, gave by far the best performance. Mixtures in which Highlight was the fescue component also rated in the top 10. Blended bluegrasses and mixtures containing blended bluegrasses, generally rated well, though we believe in the case of the latter, it depends to some degree on the selection of the fescue component.

Penncross Bent/Highlight Fescue mixture gave a high rating, however, this was due primarily to the fact that by the end of the trial period, Highlight was the main component.

KNOWLES, R.H.

An evaluation of the use of a plastic greenhouse and hot-air heating on the forcing of strawberries on a commercial scale

Three June-bearing strawberry cultivars, Protem, Red-coat and Vibrant were used in this trial to assess the possibilities of utilizing waste heat and a plastic greenhouse to force field grown strawberries in situ for early spring harvest. It was reasoned that if this were possible then waste heat from any one of the many available sources in Alberta might be used to produce a commodity that could compete in the marketplace with fruit imported from Mexico and California at that time of year. The three cultivars used were chosen because each was known to initiate flower buds in October and each had been found to complete its rest period by the first of February.

Plants were field-grown and were managed using accepted field practices viz. mowed down in July, then fertilized and irrigated so that the plants would be fully established before winter. Start-up time for forcing varied with the season but generally coincided with the occurrence of the first mild spell in January or February.

The plantation was located beneath the sub-structure of a 24' X 100' quonset type greenhouse. At start-up time, plots were first blown free of snow then a double layer of clear mylar plastic was pulled over the ribs of the forcing structure. The space between the two plastic layers was inflated and kept under constant pressure using a small electric airblower. The forcing structure was heated by a single thermostatically controlled propane heater of 350,000 BTU capacity. It was also equipped with a gas fired vaporizer at the storage tank to assure continuous delivery of gas during very cold weather. Ventilation and cooling was achieved by use of pressure activated louvers in the north wall of the greenhouse and two thermostatically controlled exhaust fans in the south wall. Moisture was supplied to plants by soaker hose which delivered a constant supply of water at low rates from a reservoir located in the greenhouse.

For the first 3 years of the trial, the cultivar Protem was used exclusively with the plants being permitted to grow in the conventional four inch wide matted row. From the date of start-up it required four weeks to activate the plantation and have plants large enough to foliar feed. Urea (46-0-0) was used to provide nitrogen at the rate of 53 kg per hectare. It was applied in solution at weekly intervals up until the time blossoming was general throughout the plantation, after which feeding was discontinued.

Surprisingly the lengthening day following the winter solstice had little effect on the time of first cropping. It made little difference to the length of time required to produce a crop whether the start-up time commenced January 31 or March 1.

In successive years it was noted that the highest quality fruit and earliest production seemed to occur at the edges of the plots. If this was indeed that case then obviously a cultural system that would maximize this edge effect would be an advantage. To test the effect of edge on production an experiment was carried out using cultivars Red-coat and Vibrant. Two types of bed were used. Both covered the same area, 24 square feet, but bed-type A had 8 extra feet of perimeter than bed-type B. The experiment was replicated four times and the two cultivars were randomized within each replicate.

Treatment effect was highly significant and supported the observation that there was indeed an effect of edge on production. Analysis of variance also showed a highly significant effect attributable to differences in cultivar. This variance however was unaffected by bed-type.

This forcing trial is now complete. It has been demonstrated that forcing strawberries is a possibility. However, there are a couple of things that would deter commercial acceptance of strawberry forcing with waste heat at this time. Both have to do with the high number of culls, the so-called 'monkey-faces' common in strawberries and, at certain stages during the production period, a large number of small sized fruit. The first of these problems could be due to improper pollination which may be associated with flower characteristics or to the fact that insect activity is practically non-existant in the forcing greenhouse. The small fruited cell however is likely due to cultural deficiency. We will continue to work on these problems in greenhouse and growth chamber studies but at the level of the single plant.

TOOP, E.W.

The effect of cultural procedures on the bulbing and flowering of tulips

Tulip bulbs, cultivar Gudoshnik, were planted at two depths (20 cm and 10 cm) in three successive plantings (series) over a three-year period. After the original flowering and maturation of the bulbs for each series, the bulbs were harvested and sorted into three size categories. The bulbs within each size category were further divided into three equal lots for storage temperature treatments prior to replanting in the field in early October. Storage treatments were as follows:

1. Warm dry storage (room temperature) from time of harvesting and sorting until replanting in October,
2. Initial warm dry storage followed by cold storage (5°C) for eight weeks prior to replanting,
3. Initial warm dry storage followed by cold storage (5°C) for four weeks prior to replanting.

The major overall effects of the treatments can be summarized as follows:

1. The shallower planting resulted in a higher production of replacement bulbs regardless of other treatment effects with the increase ranging from approximately 12% to as much as 44%.
2. Shallow planted bulbs (10 cm depth) averged 3.6 replacement bulbs/bulb planted whereas deep planted bulbs (20 cm depth) averaged only 2.95.
3. Despite the higher number of bulbs produced at the shallow planting the majority were small. The deeper planting resulted in a higher percentage of bulbs of sufficient size to produce a good flower the following spring season.
4. The percentage of bulbs produced from deep planted stock that were over 10 cm in circumference averaged over 16%. The comparable figure from shallow planted stock was only 10%.
5. In general precooling prior to planting appeared to have no consistent effect on replacement bulb production.

VANDEN BORN, W.H.

Integrated wild oat control: herbicide-fertilizer interactions

The project was begun in 1974 and was conducted jointly between The University of Alberta and the Agriculture Canada Research Station at Lacombe (Dr. D.K. McBeath). Problems investigated during the study included wild oat seed dormancy, germination response to nitrogen fertilizer and to fall or spring tillage, crop yield effects of nitrogen and phosphorus fertilizer placement relative to wild oat, wheat, and barley seed, uptake of nitrogen and phosphorus by wild oats and wheat or barley under different fertilization and weed control regimes, interaction effects on crop yield between different fertilizer and chemical weed control treatments, and uptake and translocation studies with ^{14}C-labelled asulam and difenzoquat. Results emphasized the importance of combining adequate fertilization with appropriate chemical control practices to achieve maximum yields. These findings for wild oats were also valid for infestations of Tartary buckwheat. In order to get the maximum value from investment in plant nutrients, especially nitrogen, it is essential that the weeds be controlled at the proper time, that is, as early as possible. In addition, better weed control is achieved when the crop is properly fertilized because the crop is able to compete more effectively with the weeds for the resources available.

VANDEN BORN, W.H.

Chemical control of wild oats

The project, begun in 1974, was designed to achieve more effective ways of controlling wild oats by already available as well as by new, experimental herbicides. An additional objective was a fuller understanding of the mode of action of several wild oat herbicides used alone or in combination with each other. Synergistic combinations of wild oat herbicides were identified and led, for example, to the inclusion of recommended combinations of CARBYNE (barban) and ENDAVEN (benzoylprop ethyl) on the labels of these commercial products. Field and greenhouse trials with the experimental wild oat herbicide HOE 23408 (diclofop methyl) contributed substantially to its development as an effective commercial product, HOEGRASS. Our findings of improved activity of the herbicide with certain surfactants resulted in formulation changes and helped make possible its use on barley as well as wheat. Our increased understanding of the factors involved in wild oat herbicide action and interaction has been documented in scientific papers, research summaries, and popular articles.

WALTON, P.D.

Seed and forage yield testing of improved grass cultivars

A series of variety trials located at various centres throughout the province of Alberta have been used to compare the forage and seed yield of new selection lines of smooth grass and crested wheat.

Smooth Bromse Grass

Smooth brome grass tests were established in 1979 at Ellerslie, Lethbridge and Lacombe. These trials compared two selection lines with two controls (Magna and Carlton). In each trial eight replications were used to evaluate forage yield and four additional replications compared seed production from the strains included in the test. The trial conducted at Lacombe was harvested in such a way as to simulate "grazing". In the Lacombe trial harvesting took place on five occasions during the summer when the plants were at the grazing height. In 1981 four replications from the Ellerslie trial were harvested in the same manner as those at Lacombe. In all other trials and years there were two cuts per season taken at the hay stage. The total yield of dry matter from all trials is set out in Table 1. The two selection strains (38 and 367/106) out-yielded Magna. However the increase in dry matter production over Magna which might be expected from the new strains was not large. Considering next seed production, Table 2 shows that Strain 38 and Strain 367/106 gave seed yields which were respectively 77 percent and 55 percent of those obtained from Magna. Since the increase in dry matter production from the new strains is only modest and the decrease in seed production is substantial it is recommended that the two strains under test be retained for breeding purpose only and not be regarded as material with a potential for licensing. These trials will now be discontinued.

In 1980, smooth brome grass strain tests were established at Ellerslie, Olds, Kinsella and on the Beniuck farm near St. Paul. These tests compared Strains 38 and 367/106 with four new selection lines (MB, MS, CS and MC) and with two controls (Magna and Carlton). Eight replications were used to test the total dry-matter production from the trial entries and, at Ellerslie, Olds and St. Paul, an additional four replications were used to evaluate seed production. The total dry matter yield for these strains which is set out in Table 3 was obtained from two cuts taken at the hay stage. When considered over all locations, the dry matter yield of 38 and 367/106 were similar to the values reported from the 1979 establishment. The more recent selections performed better than 38 and 367/106 in all cases. MS gave the highest yield closely followed by MC. Table 4 shows that the seed yield from MC was substantially greater than that from Magna (139%). The seed yield from MS is similar to that of Magna. These two lines (MS and MC) show excellent potential in terms of both dry matter and seed production. These trials should be continued for a further year and, provided the present level of performance is maintained, this material should be considered for licensing.

Crested Wheat Grass

Crested wheat grass trials consisting of eight replications to compare dry method production from two cuts taken at the hay stage and four replications to test seed production were established at Ellerslie and Lethbridge in 1979 and Kinsella in 1980. All trials compared two selection lines with the commercial cultivars Fairway and Nordon. The yields of dry matter set out in Table 5 and the seed production figures (Table 6) confirm the results confirmed in 1980. The seed yields of the selection strains are substantially lower than those of Fairway, while the dry matter production from Strain 67 is only slightly greater than that of the control. This material will be retained for breeding purposes and the trials will be discontinued.

TABLE 1

Total yield of dry matter from smooth brome grass strains in 1979, 1980 and 1981

	Yield of dry matter in kg/ha							
	Ellerslie				Lacombe	Lethbridge		
Strain	1979	1980	1981		1980	1980	1981	% Magna
			hay	"grazed"	"grazed"			
38	3,306	11,581	12,955	6,763	8,562	7,715	7,024	102
367/106	3,330	11,842	13,561	7,318	7,770	8,295	7,535	105
Magna	2,918	10,719	13,054	6,849	7,705	7,568	7,766	100
Carlton	2,685	10,520	11,930	7,231	7,879	7,442	7,789	98

TABLE 2

Yield of seed from smooth brome grass strains in 1979 and 1980

	Ellerslie kg/ha		Lethbridge kg/ha		
Strain	1980	1981	1980	1981	% Magna
38	171	1,369	203	1,694	77
367/106	107	1,110	159	1,064	55
Magna	321	1,980	270	1,898	100
Carlton	228	1,516	207	1,477	77

TABLE 3

Total yield of dry matter of smooth brome grass strains in 1980 and 1981

	Yield of dry matter, kg/ha					
	Ellerslie	Olds	Kinsella		Beniuck	
Strain	1981	1981	1980	1981	1981	% Magna
MB	10,118	11,896	4,507	2,998	1,823	109
MS	10,997	12,164	4,009	3,580	1,718	113
CS	9,986	11,205	4,436	3,449	1,871	108
38	9,908	11,640	4,348	2,695	1,676	105
MC	11,353	11,085	4,296	3,363	1,724	111
367/106	10,533	11,319	4,009	3,037	1,805	107
Magna	8,907	11,409	3,525	3,239	1,676	100
Carlton	8,218	11,513	2,998	3,209	1,766	97

TABLE 4

Yield of seed from smooth brome grass strains in 1981

Strain	Ellerslie kg/ha	Olds kg/ha	Beniuck kg/ha	% Magna
MC	2,264	2,079	571	139
MS	1,727	1,564	331	100
MB	1,825	1,841	351	111
CS	1,594	1,775	444	105
367/106	1,810	1,699	350	107
Magna	1,487	1,977	157	100

TABLE 5

Total yield of dry matter from 2 cuts of crested wheat grass strains in 1979, 1980 and 1981

	Yield of dry matter kg/ha						
	Lethbridge		*Ellerslie*			*Kinsella*	
Strain	*1980*	*1981*	*1979*	*1980*	*1981*	*1981*	*%*
Fairway							
67	8,731	7,983	2,303	11,170	13,280	3,529	102
Fairway	8,071	7,145	2,174	11,048	13,714	3,769	100
Nordon	8,586	6,609	1,874	9,804	13,991	3,806	97
946	8,093	6,898	1,772	10,151	13,321	3,031	88

TABLE 6

Yield of seed from crested wheat grass strains in 1980 and 1981

	Lethbridge kg/ha		*Ellerslie kg/ha*		
Strain	*1980*	*1981*	*1980*	*1981*	*%*
Fairway					
67	256	1,620	264	1,585	78
Fairway	270	2,235	261	2,006	100
Nordon	179	1,685	297	1,712	81
946	192	1,905	278	1,632	83

RURAL ECONOMY

APEDAILE, L.P.

Assessment of technical input/output relationships for northern Alberta agriculture

The purpose of this research was to assemble data from ongoing farm enterprises into a model which could estimate the impact of various agriculture policies such as grants, transport subsidies, price supports, farm fuel tax rebates and credit, on net farm incomes and production. Data was obtained from farmers during 1970 and 1974 in that part of Alberta roughly north of Wetaskiwin. A linear programming model was designed for 53 activities with 56 constraints. The input/output coefficients represent average farm experience.

Solutions to various problems addressed by the model were stable for resource changes and sensitive to relative price changes. Using 1968 prices for inputs and commodities, the model demonstrated the prevailing diversification of northern Alberta agriculture with somewhat higher levels of output than commonly observed. With 1974 prices which were favourble for grains and rapeseed, the solution showed that a shift to a rapeseed monoculture would maximize net farm income in the absence of risk and livestock shutdown costs. Some experimentation with higher freight rates and higher energy costs suppressed net farm incomes slightly without changing the mix of enterprises. In all solutions substantial proportions of available family labour were not required suggesting high rates of current underemployment of farm family members. This labour is normally used for maintenance, yard work, market activities and information gathering not accounted for in the model.

Actual numerical solutions for various problems analysed with the model are contingent on the assumptions of linearity, choice of prices and aggregation procedures. Considerable time has been spent attempting to adequately represent the dynamics of various beef enterprises within the static framework of the model, so far with limited success. Other work is pending with the moments of the probability distribution functions for the input/output coefficients as a means to incorporate risk into the model.

GILL, D.S.

An exploration into the non-formal educational needs of rural women in a selected area of Alberta and their relationship to selected programs

The objective of this study was to assess the congruence between the non-formal educational needs of rural women and the programs of two organizations (Alberta Women's Institute and the Women of Unifarm) serving such needs. An understanding of the nature of the educational programs of these organizations was gained through the study of published material, records, and interviews with key individuals. To assess the current educational needs of rural women, a field survey was undertaken through a mailed questionnaire in the county of Wetaskiwin. The rationale for the study stems from the fact that needs constitute the core around which successful educational programs are built. Thus, the identification of educational needs is of central importance to relevant programming. Also, organizations encounter difficulties in keeping pace with rapidly changing needs of their clientele and tend to fall behind in their programming.

This study found that the most salient areas of educational need are firstly, the knowledge and skills in the area of economics and management to fulfill rural womens' personal-family role; and secondly, there is a need for rural women to learn skills in interpersonal family relationships. It was found that needs in these two areas must be met in order to close the gap between the actual situation in which rural women find themselves and the situation they perceive as desirable. Furthermore, there is a need to resolve conflict between womens' actual situation and their desirable situation. The study showed that while the family role is central in the "actual", the personal-family role is central in the "desirable" situation.

An examination and analysis of the educational role of the two organizations in meeting these needs demonstrated that the two organizations are presently providing some programming in the most salient need areas identified in this study. However, the rate of participation in these programs is low, which points toward a need to improve strategies for program planning to make these programs more attractive to rural women. The general philosophy of the organizations contains some elements which appear to be carry-overs from the past and were quite relevant to the needs of the clientele in the past. With changing needs these elements have considerably less appeal to the present rural woman. The perceptions within the organizations pointed towards a somewhat rigid and stereotyped view of the adult female role at the time of data collection.

The study suggests improved programming strategies. It also points towards a re-examination of the appropriateness of organizational objectives, creeds and mottos in the light of rural women's current concerns. A review of the perceptions of the adult female role in the light of perceptions is recommended and a greater flexibility in role perceptions is suggested. In view of the diminishing social differences between the rural and the urban, communication and interaction between urban women's groups and programs and these organizations catering to rural women is suggested.

VEEMAN, M.M.

An investigation into Alberta fluid milk quota practices

Information was gathered on the practices involved in the transfer of fluid milk quota between producers in the various milk control areas of Alberta. Data on quota values associated with such transfers were collected. There was variation in fluid milk quota values between the different fluid milk control areas and considerable variation in fluid milk quota values over time. The relationships between fluid milk quota values and selected economic indicators were examined using multiple regression analysis. The economic indicators investigated were the difference between prices of fluid and industrial milk in Alberta; Calgary and Edmonton beef prices; and the components and subcomponents of the "composite index" used in the pricing formula for fluid milk. The fluid-industrial milk price variable was negatively related to quota values when this relationship was tested on deflated (i.e. real) data; however, the relationship between these variables was, as expected, positive when tested on nominal (i.e. undeflated) data. This suggests that producers may think of and react to fluid-industrial milk price differences in nominal terms rather than in real terms. Average steer prices were related inversely to fluid milk quota values, a feature which may reflect joint dairy-beef operations by a number of producers. Thus, when beef prices are low, resources may be shifted more towards milk production, and vice-versa. Quota values were also related to various cost indexes particularly the cost indexes for farm inputs, dairy feed, and hay prices. Farm wages were not strongly related to quota values, suggesting that this factor may not be as major a contributor to farm costs as implied in the composite index used in pricing milk. The study also showed that a number of components of the composite index are very strongly related. This suggests that the formula could be considerably simplified without changing its impact.

The study concluded that, as in other regualted industries, increased stability for the Alberta fluid milk industry has been achieved with some loss of efficiency. Changes in the quota system to facilitate quota transfers between fluid milk control areas would increase productive efficiency. Updating of the base of the composite milk pricing formula and improved sampling techniques to define the base are recommended.

SOIL SCIENCE

NYBORG, M.

Soil testing — evaluation and improvement

This project was conducted from 1970 to 1981 in co-operation with the Alberta Soil and Feed Testing Laboratory, with the purpose of improving soil testing for nitrogen, phosphorus and potassium in farm soils. From 1970 to 1976 this work was a part of a much larger co-ordinated project involving the Canada Agriculture Research Stations at Beaverlodge, Lacombe, and Lethbridge; the Soils Branch of Alberta Agriculture; the Western Co-operative Fertilizer Limited; and Sherritt Gordon Mines Limited. Consequently, more than 200 similar field experiments were conducted throughout the Province to compare different soil tests with crop response to different rates of nitrogen, phosphorus and potassium fertilizers. The crops were barley, rapeseed, or wheat. The results indicated that crops when grown on stubble gave large responses to nitrogen in almost all cases, and often there were responses to nitrogen even on fallows. The crop responses were closely predicted by the soil test which measures the nitrate in the soil in the spring.

The cooperative project was also conducted with grasses or alfalfa at a limited number of sites. The grasses in all cases gave very large yield responses to nitrogen fertilizers (yields increased by a factor of 2 to 4).

Since 1976 the investigation has changed to finding the reliability of soil testing for nitrogen when the soils were sampled at different times in the fall. The conclusion was that soil sampling in the late fall (late October or early November) gave better predictions of crop response to nitrogen fertilizer than did the earlier fall soil sampling. This work also revealed that the crop available nitrogen in soils (that is, ammonium and nitrate) increases during the winter, even though the soils are deeply frozen.

ANDREW, W.T., E. RAPP

Supplementary irrigation and fertigation of Russet Burbank and Norland potatoes

Irrigation of potatoes in Southern Alberta has been a common practice for many years. In recent years there has been an increasing interest in the feasibility of supplemental irrigation of potatoes in the central portion of the province.

One of the objectives of this three year project was to determine the influence of three levels of soil moisture on the growth of Russet Burbank and Norland potatoes. The treatments studied were (a) no irrigation, (b) irrigation when the soil moisture level decreased to 50% of field capacity (F.C.), (c) irrigation when the soil moisture level decreased to 75% of F.C.

In two of the three years, yields of Russet Burbank with irrigation were significantly higher than without irrigation. The three year average yield with irrigation - 335 cwt/ac (37255 kg/ha) was significantly greater than the three year average without irrigation — 302 cwt/ac (33854 kg/ha). Yield for irrigation at 75% F.C. was not significantly greater than yield for irrigation at 50% F.C.

In only one of the three years, were yields of Norland with irrigation significantly higher than yields without irrigation. However, the three years average yield with irrigation — 336 cwt/ac (37665 kg/ha) was significantly greater than the three year average without irrigation — 293 cwt/ac (32845 kg/ha). As was the case with Russet Burbank yield of Norland for irrigation at 75% F.C. was not significantly greater than yield for irrigation at 50% F.C.

Based upon the three year average yields and an average price of $4.00/cwt the increased gross return per 100 ac/year was $13,200 for Russet Burbanks and $17,200 for Norlands.

As a consequence of inquiries as to the possible advantages of splitting the application of nitrogen required and the possibility of applying it through an irrigation system (fertigation) the second objective of this project was to compare three methods of application of nitrogen fertilizer. The treatments studied were (a) all fertilizer applied at time of planting, (b) half the nitrogen (N) applied at planting time and half top dressed later, (c) half the N applied at planting time and half applied later by fertigation.

In only one of the three years was the yield of Russet Burbank significantly increased by splitting the N into two applications. The three year average indicated no significant increase in yield as a consequence of such splitting. There was no significant difference in any year between top dressing of nitrogen and fertigation.

With Norland potatoes there were no significant yield differences attributable to time or method of N application in any of the three years.

SIMON FRASER UNIVERSITY

BORDEN, J.H.

Pheromones and host attractants for stored grain insects

The research objectives were to identify pheromones and host attractants used by Canadian stored grain pests, primarily the rusty grain beetle, *Cryptolestes ferrugineus*.

A. Rusty Grain Beetle

Initial research focused on developing laboratory bioassays for the response of this beetle to volatile attractants from air passed over thousands of beetles or their frass. Once attractive extracts were obtained, chemical fractionation proceeded followed by spectrometric analysis of the most active fractions, identification of putative pheromones and synthesis of these compounds to verify the identifications. All steps were monitored by bioassays.

Two new aggregation pheromones, ferrulactones I and II were identified from *C. ferrugineus*. They act synergistically in laboratory bioassays. In preliminary field tests conducted in 1981 by Dr. S. R. Loschiare, Agriculture Canada, Winnipeg, they were highly attractive to beetles in farm stored grain. Thus they have significant potential in increasing the sensitivity of detection systems for this insect.

As suggested by Mr. M. G. Dolinski of Alberta Agriculture, they may be particularly useful in detecting residual beetles in empty storage bins, if a suitable trap can be developed. These bins could be treated with a potent but noresidual insecticide. Infestations would then be prevented, because new grain would be placed in "clean" bins.

B. Merchant Grain Beetle

Research on *Oryzaephilus mercator* has followed the same general trend as that on the rusty grain beetle. Recently, four attractants for the beetle have been identified, three host-produced aldehydes (from oats) and a beetle-produced lactone aggregation pheromone similar to that produced by *C. ferrugineus*. These attractants have major potential use for detecting infestations in food storage areas and in dwellings.

C. Other Insects

Pheromone isolation projects are currently underway for the saw-toothed grain beetle, *Oryzaephilus surinamensis*, as well as for *Cryptolestes pusillus* and *C. turcicus*. We also plan to investigate attractants of the red flour beetle to determine if a new pheromone identified by Japanese scientists acts alone or in conjunction with other materials. This research should eventually allow attractants for both the rusty grain beetle and the red flour beetle to be combined in the same trap, thus nailing the two major insect pests of Canadian stored grain in a single detection system.

WESTERN COLLEGE OF VETERINARY MEDICINE

SAUNDERS, J.R.

Studies on the prevention and epidemiology of bovine Haemophilus septicemia

A ten-year study of losses from *Haemophilus somnus* infections in western Canadian herds showed that typical outbreaks of ITEME involved feedlot cattle usually about four weeks after their arrival and often following a bout of respiratory disease. The economic loss per herd was $3,190.00 based on an average of five deaths and 15 sick animals.

A commercial vaccine tested under field conditions in six herds (1114 cattle) did not completely prevent disease but significantly reduced morbidity and mortality.

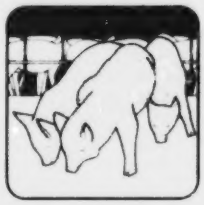
Epidemiological studies in 1981 showed that approximately 10% of 780 bulls sampled had *H. somnus* in their semen and therefore were a potential source of infection for other cattle. The significance of this finding is still unclear.

In applying these findings it is recommended that stockmen who have previously had this disease in their herds should:
(1) annually vaccinate calves and feedlot animals:
(2) obtain replacements from herds not previously affected;
(3) and, in case of outbreaks seek veterinary assistance early.

AGRICULTURAL ENGINEERING

RAPP, E.
Evaluating drainage feasibility of some Alberta soils (1972-1973)

RAPP, E.
Irrigation scheduling for supplemental irrigation in central and northern Alberta (1979-1980)



ANIMAL SCIENCE

AHERNE, F.X.
The effects of rapeseed supplemented diets on swine performance, color and pH of pork (1979-1980)

AHERNE, F.X.
The use of electrolytes and crude immunoglobulins in curing and preventing pre-weaning and post-weaning scours in pigs (1980-1981)

BERG, R.T., M.A. PRICE, R.T. HARDIN
Strategies for beef cattle improvement (1980-1981)

HARDIN, R.T.
Rate of tissue growth and changes in body composition (1968-1969)

HARDIN, R.T.
Recombination of quantitative traits in sheep (1968-1969)

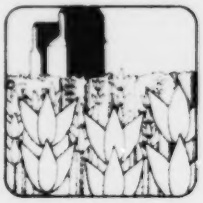
SAUER, W.C.
Evaluation of high lysine barley in pig starter diets (1978-1979)

YOUNG, B.A.
Climatic influences on nutrition of cattle (1977-1978)

FOOD SCIENCE

JACKSON, E.D.
Evaluation of the keeping quality and causes of reduced shelf-life in pasteurized fluid milk produced by Albertan dairies (1979-1 980)

LeMAGUER, M.
Aqueous food freezants (1979-1980)



PLANT SCIENCE

BAILEY, A.W.
A brush control system for controlling aspen forest using herbicide followed by fire (1979-1980)

BENN, M.H.
Alsike clover hepatotoxin (1980-1981)

BRIGGS, K.G.
Effects of plant density and competition on selection methods used for the genetic improvement of six row barley (1977-1978)

CLARKE, E.A.
Interspecific competition in pastures under continuous and rotational grazing management (1980-1981)

COLOTELO, N.
Role of exudates from aerial mycelium of sclerotiorum and Fusarium species in pathogenesis (1973-1974)

HIRUKI, C.
Serological and anatomical studies on plant mollicute diseases with special reference to their diagnostic value (1979-1980)

KNOWLES, R.H.
The behaviour of turfgrass growing on minimal medium in response to irrigation and nutritional inputs (1980-1981)

KONDRA, Z.P.
Evaluation of genetic variability in breeders' seed of licensed varieties and advanced selections of rape (B. napus L.) (1977-1978)

KONDRA, Z.P.
Rapeseed growth analysis as related to crop maturity and seed yield (1980-1981)

RURAL ECONOMY

HAWKINS, M.H., R.R. NORBY
Meat price relationships - farm, wholesale and retail (1980-1981)

HAWKINS, M.H., M.M. VEEMAN
Market innovations and price behaviour — Alberta hogs (1980-1981)

LEROHL, M.L., M.H. HAWKINS
Canadian grade standards for wheat and export market potential (1978-1979)

MANNING, T.W.
The potential impact of rising energy prices on the use and allocation of resources in grain production (1980-1981)

PETERSEN, T.A.
Development of a farm management simulation model for teaching and research (1973-1974)

PETERSEN, T.A.
Analysis of farm leases and rental arrangements in Alberta (1980-1981)

PETERSEN, T.A.
The economics of continuous cropping in the dark brown soil zone of Alberta (1980-1981)

SOIL SCIENCE

COOK, F.D., F.V. MacHARDY
Measurement of photosynthate requirement for nitrogen fixation by selected free-living microorganisms found in Alberta soils (1977-1978)

COOK, F.D.
Inoculum for pulses (1979-1980)

CROWN, P.H.
An assessment of the deep plowing potential of solonetzic soils in the Leduc area, Alberta (1978-1979)

MacHARDY, F.V.
Assessment of nitrogen contribution to cereals by intercropping with annual legumes (1977-1978)

NYBORG, M.P.K.
Rate of oxidation of elemental sulphur fertilizers (1980-1981)

PLUTH, D.J.
Productivity ratings for soil types in Edson and Whitecourt map areas (1968-1969)

PLUTH, D.J.
Nutrient distribution and cycling in selected forest ecosystems (1968-1969)

ROBERTSON, J.A.
Available phosphorus in Alberta soils (1976-1977)

ROBERTSON, J.A.
K status of soils in northeastern Alberta (1979-1980)

WEBSTER, G.R.
Testing of a revised soil-moisture budget (1978-1979)

INTERDISCIPLINARY

ANDREW, W.T., K.W. DOMIER
The integration of seed pieces, cutters and planters for better plant stands in potato fields (1977-1978)

ANDREW, W.T., K.W. DOMIER
A systematic study of potato cutters, seed pieces and planters (1980-1981)

BERG, R.T., Z.J. HAWRYSH, M.A. PRICE
Assessment of optimum slaughter weight and condition in beef cattle (1979-1980)

CLEGG, L.F.L., W.T. ANDREW
Fertilizer and trace element studies (1974-1975)

DOMIER, K.W., J.A. ROBERTSON
Fertilizer placement in tilled and untilled soils (1979-1980)

NYBORG, M., K.W. DOMIER
Placing fertilizer in bands or nests (1980-1981)

UNIVERSITY OF BRITISH COLUMBIA

COPEMAN, R.J.
Serological detection methods for Corynebacterium sepedonicum (1977-1978)

UNIVERSITY OF CALGARY

COSTERTON, J.W.
Bacterial colonization of the surfaces of cells of the digestive tract (1977-1978)

COSTERTON, J.W.
Evaluation of forage crops by in vitro digestion with rumen bacteria (1980-1981)

VETERINARY INFECTIOUS DISEASE ORGANIZATION

ACRES, S.D.
Living vaccine against calf scours caused by enteropathogenic E. coli (1978-1979)

BIGLAND, C.H.
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WESTERN COLLEGE OF VETERINARY MEDICINE

FORSYTH, G.W.
Control of intestinal secretion in colibacillosis in pigs (1978-1979)

GUDMUNDSON, J., M.E. SMART
A survey of trace mineral metabolism in purebred and percentage Simmental cattle (1978-1979)

MAPLETOFT, R., N.C. RAWLINGS, W.D. HUMPHREY
Induction of abortion in feedlot heifers (1979-1980)

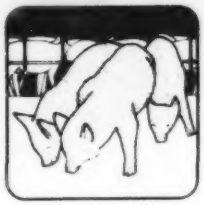
OSBORNE, A.D., J.R. SAUNDERS
Investigation of the pathogenesis of pneumonia resulting from infection by Haemophilus pleuropneumoniae (1980-1981)

POLLEY, L.R.
A necropsy study of the occurrence of selected helminth parasitisms among horses in western Canada (1979-1980)

RADOSTITS, O.M.
An in-depth study of neonatal diarrhea in calves (1972-1973)

RAWLINGS, N.C.
The endrocrinology and physiology of blastocyst implantation in the ewe (1978-1979)

STOCKDALE, P.H.G.
Immunological control of shipping fever in cattle (1979-1980)



ANIMAL SCIENCE

KENNELLY, J.J.

Full-fat canola seed for lactating dairy cows and steers

The purpose of this project is to determine:

(a) The influence of full-fat canola seed on milk yield and composition and digestibility coefficients of the diet.

(b) The extent to which this fat escapes degradation in the rumen.

The addition of fat, especially protected fat, has been shown to result in increased milk yield and milk fat percent. Because of its high fat level full-fat canola seed could supply both supplemental fat and protein for lactating dairy cows. Should the feeding of full-fat canola seed result in increased milk yield and fat content it could replace some of the expensive protected fat products which are currently used with consequent financial savings to the producer.

MILLIGAN, L.P., P.M. KENNEDY

Effects of soluble and bypass protein supplements on intake and utilization of straw

Previous experiments have shown that wintering beef cows can be maintained on rations with a high component of cereal straw, which is inexpensive and readily available in western Canada. It is, however, a major problem to achieve adequate intakes of straw, but a recent preliminary study in this laboratory suggests that differences in intake by beef steers may be obtained when rapeseed meal supplements are protected from ruminal degradation by formaldehyde treatment. It is proposed to confirm this observation and later to investigate the reasons for intake differences.

SAUER, W.C.

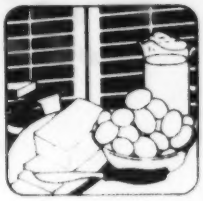
Lysine requirement of starter pigs

The objective of this project is to determine the lysine requirement of starter pigs. The information that will be obtained is needed for formulation of starter rations in western Canada for maximum animal performance.

THOMPSON, J.R., F.X. AHERNE

Etiology of development of leg weakness in swine

The overall objectives of the research outlined in this application are to define the metabolic events responsible for the altered chemical composition and structure we have observed in connective tissues from abnormal joints in growing swine. Determination of these events and thereby the ethiological factors responsible for these abnormalities, will facilitate the development of selection methods and possibly preventive treatments to minimize this condition which is particularly prevalent in rapidly gaining animals housed under confined conditions.



FOOD SCIENCE

JACKSON, E.D.

Development of methodology for the isolation of spoilage psychrotrophic bacteria of pasteurized milk from the fresh product

At present there is no bacteriological isolation technique available to the dairy industry which will routinely and accurately predict the self-life of refrigerated pasteurized fluid milk products and enable the instigation of control measures. For reasons which remain obscure, the psychrotrophic bacteria responsible for spoilage cannot be detected in the fresh product or on plant equipment. This project is initiated to determine if heat or sanitizer stress underlies these difficulties by: 1) detailed study of the physiological capabilities of the spoilage flora of refrigerated fluid milk types, 2) definities of any modified growth requirements of stressed cells and 3) development of an appropriate shelf-life monitoring tool.

JACKSON, H., I. CHUNG

A study of the levels of Vitamins A and D in milk and dairy products

The levels of Vitamin A and D in milk and dairy products are specified by law. Recent studies by Health Protection Branch indicate that many samples collected are not in compliance with the regulations. The dairy processing industry is anxious to determine the cause of the problem in order to rectify the situation. The significance to agriculture is the improvement of the quality of products to the consuming public.

LEMAGUER, M.

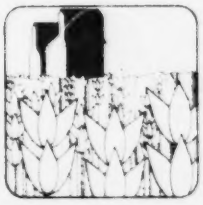
Effect of pretreatment on the texture and rehydration properties of air-dried foods

Previous experiments have shown that pretreatment such as dipping in sucrose solution improves the texture and final properties after subsequent drying. It is proposed in this project to determine the effect that a simultaneous water removal-solute (sucrose or salt) diffusion would have on the final product. This study would eventually lead to a better and cheaper quality product.

SPORNS, P.

Analysis of bee repellents in honey

Honey is an important Alberta export item to countries who will pay premium prices for pure honey. Bee repellents used by beekeepers to help in collecting honey pose a potential problem by leaving a residue in the honey that can affect the taste and acceptability of honey. The proposed project will examine the extent of bee repellent use in Alberta and the effect of this use on honey.



PLANT SCIENCE

BAILEY, A.W.

Cattle use of brush on aspen parkland rangeland

The objectives of this project are:

(1) to determine the time spent by cattle in eight habitat strata (including grassland, shrubland and aspen forest);
(2) to relate grazing preference for grass and brush by species to (a) green forage availability, (b) litter, (c) forage moisture, and (d) forage crude protein;
(3) to relate grazing preference for grass and brush species to specific environmental factors.

KONDRA, Z.P.

Evaluation of synthetic varieties for the exploitation of hybrid vigor in rapeseed

Hybrid vigor is a major genetic component of agronomic performance in Polish rapeseed (*B. campestris*). The most effective use of hybrid vigor is through the development of inbred lines and hybrid F_1 varieties which are not currently feasible in *B. campestris*. The development of synthetic varieties is the second most effective procedure in utilizing hybrid vigor and could increase yields by 10 to 20%.

VANDEN BORN, W.H.

Biology and control of cleavers (Galium aparine)

Cleavers (*Galium aparine*) has become more widespread as an annual weed in field crops in western Canada in recent years and has the potential of becoming a serious weed. In rapeseed it already is a serious weed because its seed cannot be removed rom rapeseed by mechanical means. Little information is available about its biology and the conditions that promote its spread. The objective of the project is to verify the reports about the weed's increasing importance and to obtain information about its seed germination, seedling growth and development and its competitive behaviour.

RURAL ECONOMY

MURRI, D.G.

A study of user characteristics and attitudes toward home and garden pesticide products

Specifically, this study proposes to examine the amateur user of home and garden pesticide products, rather than the products themselves. The analytical thrust of the study will, broadly speaking, be two dimensional, focusing upon:

(1) Who uses home and garden pesticides. Data will be gathered which relates to socioeconomic and demographic characteristics.

(2) How these home and garden pesticide products are used, and how they are perceived by the amateur user. Emphasis will be upon user experience with the products, including handling, storage, perceptions of labelling and instructions, and chemical poisoning.

RICHTER, J.J.

The European agricultural export subsidy and the prospect for the Canadian grain trade

The objective of this study is to assess the impact of the European Economic Coommunity's subsidized agricultural exports on the movement of Canadian grain into foreign markets.

Extremely high prices of cereals in the mid-seventies have resulted in the EEC's determined effort to increase the level of self-sufficiency. This, associated with farm income policy pursued, created structural surpluses in certain agricultural commodities.

There are two consequences arising from this EEC policy: (1) Less than 20 percent of Canada's agricultural exports went to the EEC in 1978 against 34 percent in 1969. This decline may continue, (2) Subsidized EEC exports appeared in markets of countries where Canada established a relatively strong position particularly (the CMEA and China). An analysis of these markets, their structure, price making processes and projections of trends to 1990 and 2000 will be provided.

SCHULTZ, W.M.

Financial planning models for Alberta farms

The purpose of this study is to develop a financial farm planning package in cooperation with selected farm operators in Alberta. Existing planning models will be adapted and tested in actual use with emphasis on (a) forward planning and (b) adaptability to changing outlook conditions and market expectations. The project is intended to aid farm operators in improved flexibility of operations and greater assurance of financial health, without increasing desk work and demands on scarce time.

VEEMAN, T.S., M.M. VEEMAN

Input use, productivity, and the cost-price squeeze in prairie agriculture

The objectives of this study are: (1) to determine the nature and extent of the changes which have taken place over recent years in the pattern of inputs used in prairie agriculture; (2) to assess the impact of inflation in input costs (including energy costs) on the pattern of input use; (3) to determine the effect which input cost inflation has had on productivity in prairie agriculture; and (4) to assess the implications of changes in input costs and productivity on the cost-price squeeze facing prairie producers.

SOIL SCIENCE

McGILL, W.B.

Acid phosphatase production in relation to plant — available P

The purpse of this project is to test the hypothesis that production of acid phsophatase activity in soil by microbes is related to plant response to added P.
This research is expected to help improve the accuracy of pre-planting soil tests for available P in soil. The approach developed here is biological which may relate better to what the plant experiences, than does our present strictly chemical extraction technique. Predictions of P needs based upon present soil testing methodology are still not good.

NYBORG, M.

Inhibitors of nitrification

Other AART projects have shown that application of nitrogen fertilizers in the fall have, on the average, produced only half as large yield increases of barley as when the nitrogen fertilizers were applied in the spring. Apparently the inferiority of fall-applied nitrogen fertilizer was shown to be more easily overcome by placement of the fertilizer rather than by use of inhibitors of nitrification. The objectives of this project would be to further compare placement with an inhibitor (N-Serve) using a wide range of rate of the inhibitor; and to determine if several inhibitors decrease the release of crop-available nitrogen from the soil.

WESTERN COLLEGE OF VETERINARY MEDICINE

MANNS, J.G.

Bovine infertility: a possible interaction between inflammation and prostaglandins

Beef and dairy cows are often culled because of reproductive failure. Particularly in dairy cattle, this can seriously limit genetic gain for traits such as milk production. Uterine infections of dairy cattle are a significant cause of reproductive failure; however little is known concerning the mechanism whereby the infective process causes infertility. Our previous studies in laboratory animals (guinea pig) indicate that cells such as macrophages and lymphocytes, which accumulate in the uterus during infection, produce substantial quantities of prostaglandins E and F. These latter compounds are known to control ovarian corpus luteum function. It is possible that the substances produced in the infective process can alter the endocrine physiology of the cow. The present study will test that hypothesis in samples collected from clinical material and experimental induced uterine infections.

MURPHY, B.D.

Improving embryo survival in mink

The loss due to embryonic mortality in ranch mink has been estimated to be 50 to 65 percent of the fertilized ova. One objective of the proposed study is to investigate the ovarian hormone requirements for embryo implantation in mink. The second objective is to attempt to reduce pre-implantation mortality by the administration of hormones. If these objectives can be met information will be gained which will be pertinent not only to mink but to other species, particularly pigs in which embryonic mortality reduces production.

CONTRIBUTIONS
from sources listed are gratefully acknowledged
April 1, 1981 - March 31, 1982

Alberta Pork Producers Marketing Board
Alberta Wheat Pool
Beefbooster Cattle Limited
Canadian Mink Breeder's Association
Cominco Limited
Connaught Laboratories Limited
Dairy Industry Research Trust
Dow Chemical of Canada Limited
Forcrest Foods Limited
Gem Sod Farms Limited
Hannas Seeds Limited
Imperial Oil Limited
Jacklin Seed Company
Lofts Pedigreed Seed Limited
National N-K Seeds Limited
Oseco Limited
Otto Pick and Sons Seeds Limited
Potash and Phosphate Institute
Potash Corporation of Saskatchewan
Rothwell Seeds Limited
University of Saskatchewan
Western Co-operative Fertilizers Limited

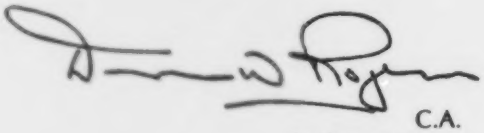
ALBERTA AGRICULTURAL RESEARCH TRUST
FINANCIAL STATEMENTS
MARCH 31, 1982

AUDITOR'S REPORT

To the Trustees of the
Alberta Agricultural Research Trust

I have examined the balance sheet of the Alberta Agricultural Research Trust as at March 31, 1982 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Trust as at March 31, 1982 and the results of its operations for the year then ended in accordance with the disclosed basis of accounting described in Note 2 to the financial statements applied on a basis consistent with that of the preceding year.



C.A.
Auditor General

Edmonton, Alberta
June 16, 1982

Statement A

ALBERTA AGRICULTURAL RESEARCH TRUST
BALANCE SHEET
AS AT MARCH 31, 1982

	1982	*1981*
ASSETS		
Current:		
Deposits in trust (Note 3)	$64,827	$29,119
LIABILITIES		
Unexpended funds, Statement B	$64,827	$29,119

The accompanying notes are part of these financial statements.

ALBERTA AGRICULTURAL RESEARCH TRUST
STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS
FOR THE YEAR ENDED MARCH 31, 1982

	1982	*1981*
REVENUE		
Contributions from the Province of Alberta — Department of Agriculture	$255,000	$250,000
Contributions from industry	135,000	131,109
Interest	29,953	21,906
	419,953	403,015
EXPENDITURE		
Research grants	361,040	368,227
Administration charge	23,205	20,456
	384,245	388,683
Excess of revenue over expenditure	35,708	14,332
Unexpended funds at beginning of year	29,119	14,787
Unexpended funds at end of year	$ 64,827	$ 29,119

ALBERTA AGRICULTURAL RESEARCH TRUST
NOTES TO THE FINANCIAL STATEMENTS
MARCH 31, 1982

Note 1 Authority

The Alberta Agricultural Research Trust operates under the authority of the Alberta Agricultural Research Trust Act, Chapter A-14, Revised Statutes of Alberta 1980.

Note 2 Significant Accounting Policies

These financial statements have been prepared in accordance with generally accepted accounting principles except that research grants expenditure is recorded on a cash basis.

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Deposits in Trust

Deposits in trust consist of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 4 Approval of Financial Statements

These financial statements were approved by management on June 16, 1982.